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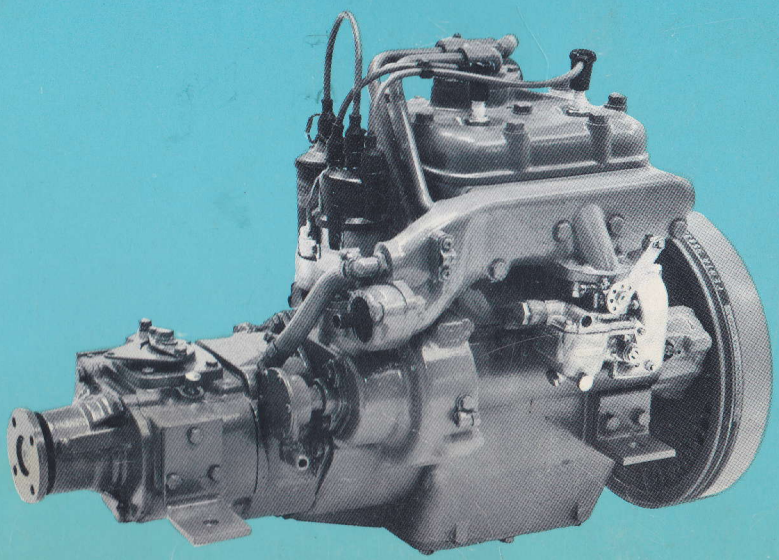
instruction book

VOLVO PENTA

marine carburetor engine



MB 10 A

FOREWORD

Before you start using your new Volvo Penta marine engine, we recommend you to read this instruction book carefully. It contains all the instructions you need to run and service your engine in the best possible way.

The dependability and the lifetime of your engine and equipment depend to a great extent on how these units are given service and maintenance. Always closely follow the instructions included in this book.

Volvo Penta has built a world-wide service organization including service workshops with specially-trained personnel at your service.

Always contact your nearest Volvo Penta representative should you need advice and also when you require service or parts.

We are fully convinced that the demands concerning good running economy and outstanding performance you have every right to make on a high-quality product such as this will be more than satisfied and that your Volvo Penta will provide you with a long period of faithful service.

GUARANTEE

Each engine is accompanied by a warranty certificate which entitles the first purchaser to a guarantee concerning both materials and labour. The extent of the guarantee is shown in the warranty card and we recommend you to read this carefully.

This certificate contains report forms which are filled in by the dealer and/or boatbuilder.

If our guarantee is to be valid, we make one absolute condition and that is that the checking procedures in the maintenance scheme are carried out and that your engine and its equipment are always looked after in accordance with the instructions in this book. When in doubt, please always contact a Volvo Penta authorized dealer.

In all correspondence with your dealer and also when ordering spare parts, always state the type designation and serial number of the engine and reverse gear (see front of engine).

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MB10A
2-cyl. – 15 h.p.

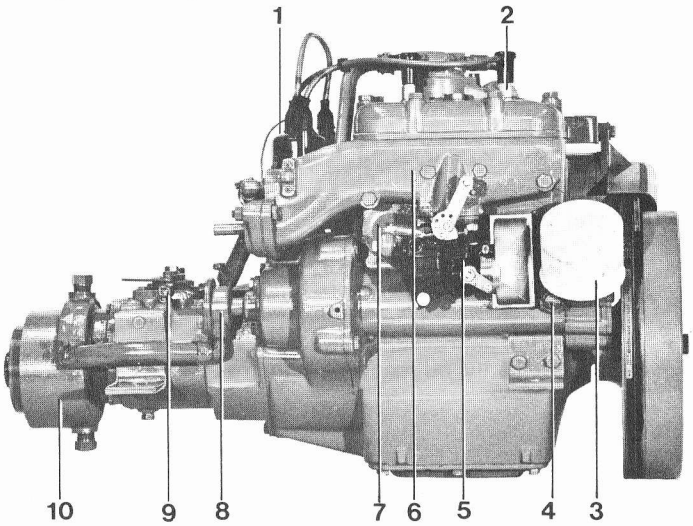


Fig. 1. MB10A, with MS reverse- and reduction gear, starboard side

1. Distributor
2. Spark plug
3. Oil filter (Later prod.)
4. Oil pressure sender
5. Carburetor with flame arrester
6. Water-cooled exhaust manifold
7. Rocker arm cover
8. Sea-water pump
9. Oil dipstick, reverse gear
10. Reduction/reverse gear MS, ratio 1.91:1
11. Starter-generator
12. Lifting eyelet
13. Thermostat and water distributing housing
14. Ignition coil
15. Reverse gear MS, ratio 1:1
16. Control arm for reverse gear
17. Fuel pump with hand primer
18. Oil dipstick, engine

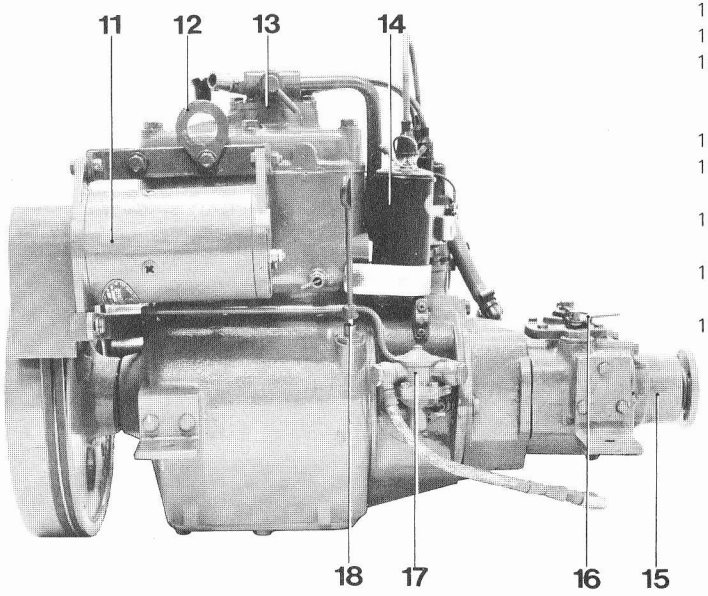


Fig. 2. MB10A, with MS reverse gear, port side

INSTRUMENTATION

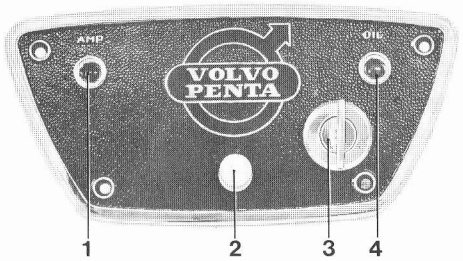


Fig. 3. Instrument panel, MB10A

1. **Warning lamp for battery charging**
   Red light – no charging
2. **Switch for extra electrical equipment**
3. **Key switch with built-in starter**
4. **Warning lamp for oil pressure**
   Red light – stop engine, insufficient oil pressure

CONTROLS

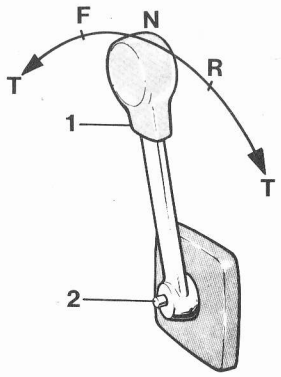


Fig. 4. Combined cortrol

1. Control lever
2. Neutral throttle knob.
   Push the button when the control lever is in neutral and move the lever forward a bit. Release the button. The gear cannot be engaged. Push in the button again and pull back the lever for synchronized throttling and shifting.

N = Neutral position
F = Forward position
R = Reverse position
T = Throttle

GENERAL INSTRUCTIONS

FUEL AND LUBRICATING OIL RECOMMENDATIONS

NOTE. Our guarantee only applies on condition that the following fuel and lubricating oil recommendations are followed:

Fuel quality

The engine is intended to be run on petrol with an octane rating of minimum 80 ROT (Research Method).

Lubricating oil quality

Only **Multigrade oil SAE 10 W/30** with quality designation **"For Service SE"1)** is to be used for lubricating the engine and reverse gear. This oil contains additives which ensure maximum lifetime for the engine and reverse gear under different conditions of operations.

RUNNING-IN

When your marine engine is new, we recommend that you run it with a certain amount of care during the first 20 hours of operation. During this time, never subject the engine to full loading for more than brief periods, because it is during this period that the moving parts wear in together.

Oil changes

During the running-in period, the engine and reverse gear lubricating oil should be changed more frequently than usual. Change the engine oil, reverse gear oil and the oil filter after 20 hours of operation, see also under "Servicing", points 3 and 4.

RECOMMENDED ENGINE SPEED

If your are to get the very best performance from your boat, it is important that the propeller is selected so that maximum engine speed is reached with a normally loaded boat. See under "Technical Data".

NOTE. When the boat has been in the water for some considerable time, maximum engine speed can decrease if there is marine growth on the bottom of the boat. Use therefore anti-fouling bottom paint. Check and clean the bottom of the boat at regular intervals.

1) Previous designation "For Service MS".

Precautions to be taken in case of frost

If there is risk of frost, drain off the cooling water to prevent cracks in the engine block and reduction gear caused by the water freezing. **Note the risk of water getting into the boat.** See also under the heading "Procedure to be followed when laying up a boat" (page 22).

RUNNING

Procedure before starting

1. Make sure that the engine compartment is well ventilated.
2. Check the lubricating oil levels in the engine and reverse gear, see under "Servicing", points 1 and 2.
3. Check the fuel level in the tank and open the cock for fuel supply to the engine. At the same time, check all fuel cocks, pipelines and screw unions for leakage.
4. Check that the drain cock for the cooling water is closed. Note. The drain plug for the reduction gear. See Fig. 22. Open the bottom cock for the cooling water intake (if one is fitted).
5. Switch on the master switch for the electrical system (if one is fitted) and pump out any bilge water that may have collected.
6. Make sure that the equipment on board includes a fire extinguisher, life vests, anchor, mooring lines and other safety equipment.

Starting

1. Move the control lever to the neutral position so that the shift mechanism disengages. See the directions given in Fig. 4. Push forward the speed control to approx. 1/4 throttle. If the engine is cold, the choke must be completely closed. The choke should not be used when starting a warm engine.
2. Turn the key switch one step to the right. Check that the warning lamps for battery charging and low oil pressure light up.
3. Press in the key switch and turn it further to the right, this cutting in the starter-generator. Release the key as soon as the engine starts. **Never race a cold engine.**
4. If the battery is so flat that it is difficult to start the engine, the engine can be started with the help of the starting crank (available as accessory).
5. Check immediately after starting that the warning lamps for oil pressure and battery charging have gone out. **Should the red oil warning lamp remain on — stop the engine immediately.**
6. Check the cooling water circulation by observing that the water is being discharged overboard. Run the engine warm at fast idling RPM. Do not let the engine run with the choke more than several minutes and never when the engine is completely warm.
7. Move the control lever to neutral in order to engage the shift mechanism (see Fig. 4). The boat is now ready for operation.

Stopping

1. Move the control lever to neutral position and let the engine run some minutes at idling speed before stopping it.
2. Turn the key switch to neutral position when the engine has stopped. **NOTE. The master switch must never be switched off before the engine has completely stopped.**
3. Switch off the master switch (if fitted) and close the fuel and cooling water cocks if the unit is to remain idle for some considerable time.
4. If the unit is to remain idle for more than two weeks, special inhibiting measures must be taken with the engine (see under "Procedure if unit is to remain idle").

   If the engine has electrical equipment, this equipment should be sprayed regularly with fluid which protects against corrosion and moisture.

TECHNICAL DESCRIPTION

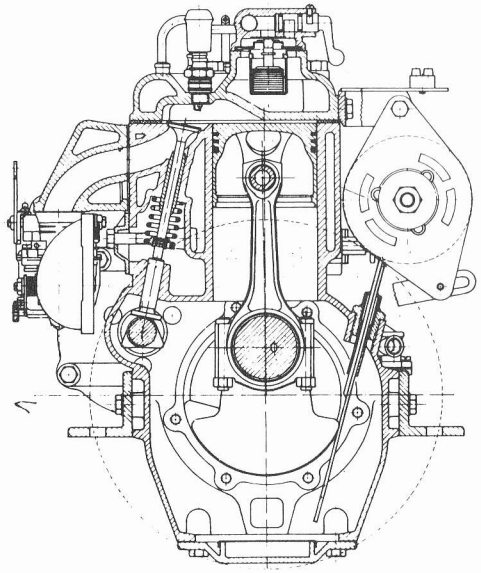


Fig. 5. Cross-section of engine

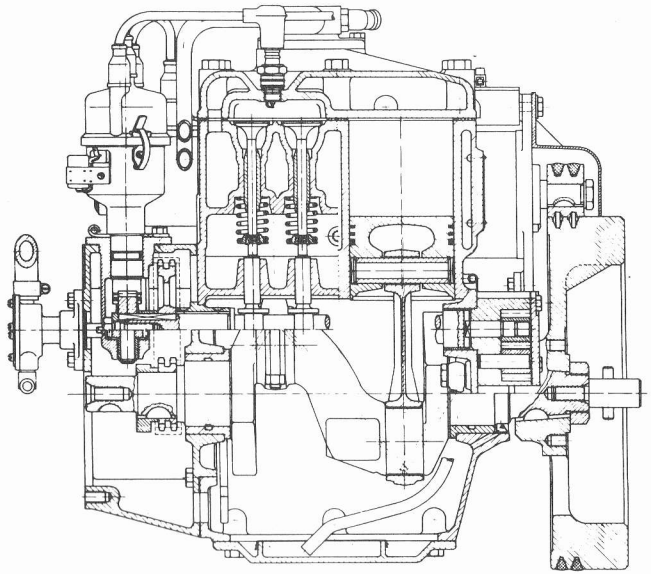


Fig. 6. Longitudinal section of engine

ENGINE UNIT

The MB10A is a 2-cylinder, 4-stroke petrol engine, specially constructed for marine use.

The cylinder block and crankcase are made in one piece. The crankcase is provided with a bottom cover. The cylinder bores, which are surrounded by cooling jackets, are drilled directly in the cylinder block.

The crankshaft is carried in two main bearings. The bearing shells are replaceable and have bearing metal of indium-plated lead-bronze.

LUBRICATING SYSTEM

The engine is fitted with a complete pressure lubricating system. The oil filter is of the full-flow type and is replaceable as a unit. It is provided with an overflow valve. The lubricating system has a relief valve which prevents the oil pressure from reaching excessive values.

FUEL SYSTEM

The engine fuel system consists of a fuel pump, carburetor with flame arrester, intake manifold and fuel lines.

The fuel pump is of the diaphragm type and is actuated by a cam on the engine camshaft. A hand priming device on the feed pump makes it possible to pump the fuel even when the engine is stopped.

COOLING SYSTEM

The engine and reduction gear are sea-water cooled and the system is fitted with a thermostat which controls the temperature of the engine. Cooling water circulation is taken care of by means of a sea-water pump mounted on the timing gear housing. The pump is driven from the camshaft through a flange. The pump impeller is made of neoprene rubber and operates against a cam. The pump sucks cooling water from the sea through the water intake. The water is then forced under pressure through the exhaust manifold cooling jackets and fills the engine water channels.

On top of the engine there is a water distributing housing provided with a thermostat. When the engine is cold, the cooling channels in the engine and exhaust manifold are filled with cooling water which is rapidly heated up. When the thermostat is closed, the surplus water passes through the distributing housing and on to the water-cooled exhaust elbow where it mixes with the exhaust gases or is conveyed overboard, depending on whether a wet or dry exhaust line has been installed.

The cooling water in the engine cooling channels is rapidly heated up and this causes the thermostat to open and force the cooling water to pass the engine cooling channels before it enters the exhaust elbow. The thermostat thus regulates the cooling water circulation so that the engine always has the right temperature irrespective of the size of the engine load.

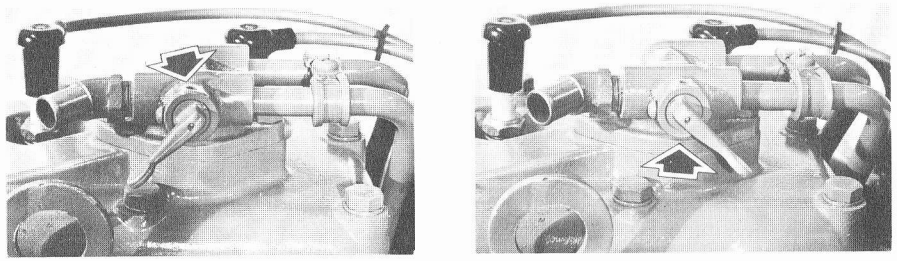


Fig. 7. Setting the two-way cock for outgoing cooling water
The cock can be locked in the desired position with a screw, see arrows

A = Setting with dry exhaust line
B = Setting with wet exhaust line

ELECTRICAL SYSTEM

The electrical system has a voltage of 12 volts and is designed specially for marine use.

The engine is equipped with a starter-generator, which means that the generator and starter motor are combined and are driven by vee-belts from the engine flywheel.

Warning!

The following applies to an engine fitted with alternator and master switch:

Never break the circuit between the alternator and battery while the engine is running. To do this would be to ruin the charging regulator immediately.

Do not switch off the master switch until the engine has stopped. See also under "Servicing", point 16.

Wiring diagram, MB10A

Cable marking

Mark	Colour	sq.mm.	AWG
1	Black	1.5	15
2	Black	2.5	13
3	Ivory	1.5	15
4	Ivory	6	9
5	Red	2.5	13
6	Red	6	9
7	Red	16	5
8	Brown	1.5	15
9	Green	1.5	15
10	Blue	1.5	15

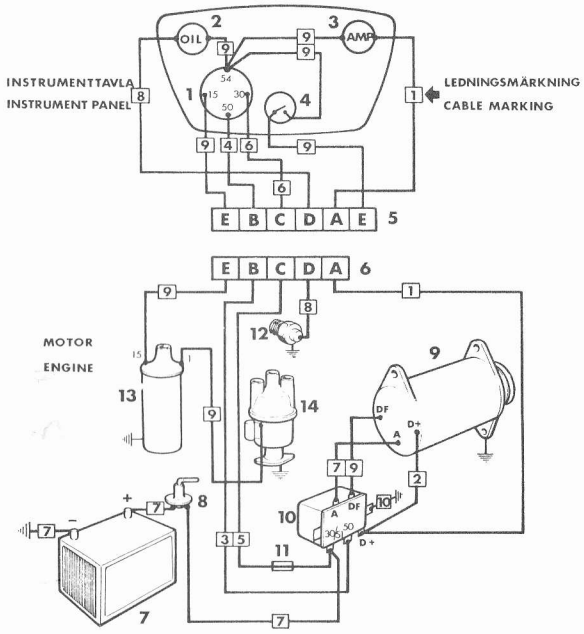


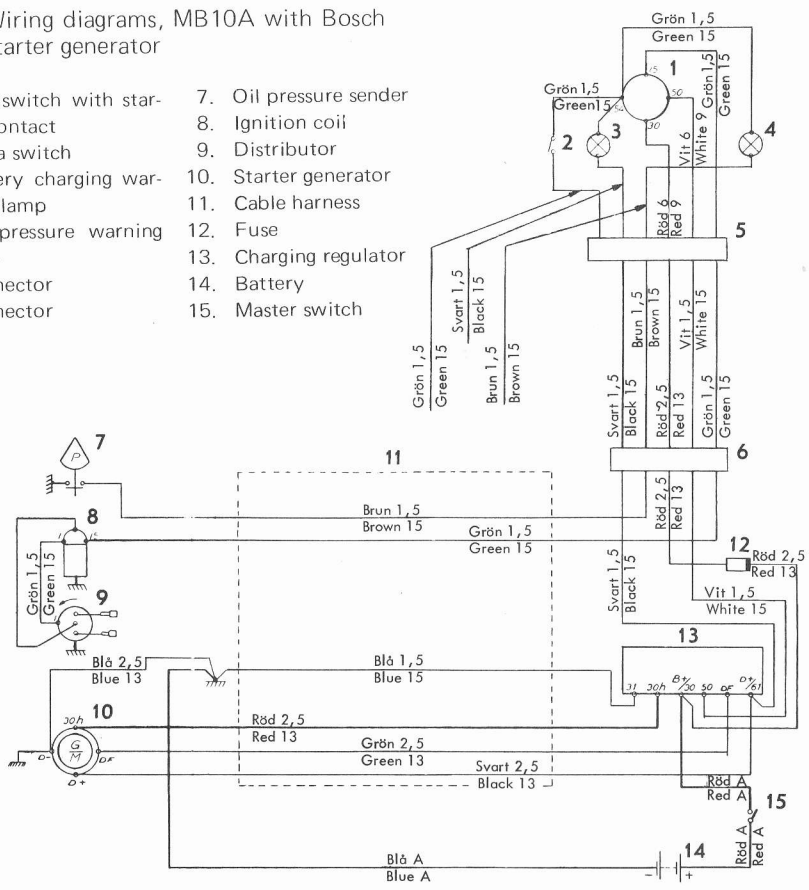
Fig. 8. Wiring diagram, MB10A with SIBA starter generator.

Components

1. Key switch
2. Warning lamp for "low oil pressure"
3. Battery charging warning lamp
4. Switch (extra)
5. Connection terminal
6. Connection terminal
7. Battery
8. Master switch
9. Starter-generator
10. Charging regulator
11. Fuse
12. Oil pressure sensor
13. Ignition coil
14. Distributor

Fig. 9. Wiring diagrams, MB10A with Bosch starter generator

1. Key switch with starter contact
2. Extra switch
3. Battery charging warning lamp
4. Oil pressure warning lamp
5. Connector
6. Connector
7. Oil pressure sender
8. Ignition coil
9. Distributor
10. Starter generator
11. Cable harness
12. Fuse
13. Charging regulator
14. Battery
15. Master switch



Reverse gear, type Mono Shift (MS)

The Volvo Penta reverse gear, type Mono Shift, has a ratio of 1:1 and, as alternative, a reduction gear with reduction ratio 1.91:1. The reduction gear is integrally built with the reverse gear.

Power is transmitted from the engine to reverse gear through a rubber flange.

For manoeuvering "Forward" and "Reverse", the Volvo Penta patented cone clutch is used. With this type of clutch, engagement is both smooth and quiet. Very little force is required to operate the reverse gear.

The engaging power of the cone clutch is influenced by the size of the power transmission torque. The greater the torque, the stiffer will be the clutch engagement with increased throttling.

MAINTENANCE SCHEME

The numbers of the servicing procedures below refer to the detailed descriptions on the following pages. Some of these operations require specialized mechanical knowledge and the use of special tools. For this reason, these operations should be carried out by an authorized service workshop.

See point	Operation	Every 14 days	After 1) 50 hours running	After 1) 100 hours running
	PERIODICAL SERVICING			
1.	Check oil level in engine	● 2)		
2.	Check oil level in reverse gear	● 2)		
3.	Change oil in engine and change oil filter		● 4)	
4.	Change oil in reverse and reduction gear		●	
5.	Clean oil strainer			3)
6.	Clean air cleaner			●
7.	Check vee-belts		●	
8.	Check valve clearances			●
9.	Check and clean fuel filter		●	
10.	Check battery electrolyte level	●		
11.	Check and change spark plugs		●	
	GENERAL SERVICING INSTRUCTIONS			
12.	Check-tighten cylinder head bolts			
13.	Ignition timing and distributor			
14.	Adjust carburetor			
15.	Cooling system			
16.	Electrical system			
17.	Check reverse and reduction gear			
18.	Procedure if unit is to remain idle and inhibiting			

To be carried out according to the intervals given under respective points or when necessary

1) Or once each season should this occur first
2) Daily before starting for first time
3) Every other year or when engine is taken out of boat
4) Change the oil filter after every 100 hours running or once each season

1.
Checking oil level in engine

Check the oil level in the engine daily before starting for the first time. The dipstick is located on the port side of the engine and has upper and lower markings. The oil level must never be allowed to go down below the lower mark and it should not be above the upper mark since this can result in abnormally high oil consumption. Remove the dipstick plug (see Fig. 12) to fill with oil. Concerning the oil quality and viscosity, see point 3.

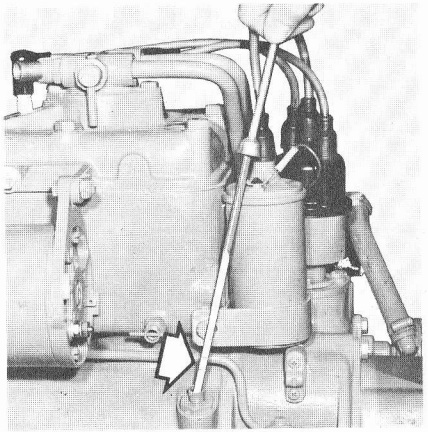


Fig. 10. Checking engine oil level

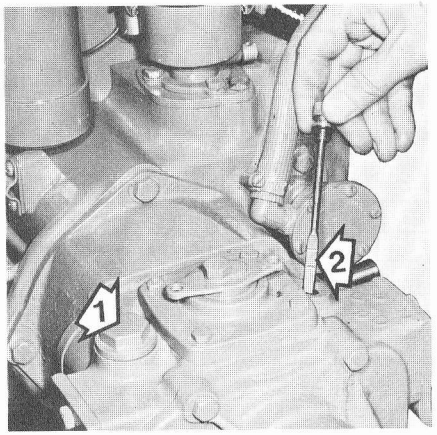


Fig. 11. Checking reverse gear oil level
1. Oil filling
2. Dipstick

2.
Checking oil level in reverse and reduction gear

The MS reverse and reduction gear has a separate oil compartment. Check the oil level daily before starting for the first time with the help of the dipstick which is located on the starboard side of the reverse gear. The oil level should be between the max.-min. marks on the dipstick (which must not be screwed down when measuring the oil level). When necessary, top up with new oil (see 1, Fig. 11). Concerning the oil quality and viscosity, see point 4.

3.
Changing the engine oil and oil filter

Change the lubricating oil after every 50 hours running or at least once each season. During the running-in period the oil should be changed after 20 hours of operation.

Run the engine warm before changing oil. The oil is sucked up from the crankcase with the help of a scavenging pump, the tube of which is inserted through the dipstick hole. The scavenging pump is supplied with the tool kit. Oil is added to the engine after removal of the plug through which the dipstick is inserted, see Fig. 12a. Concerning the oil quality and viscosity, see the table.

Change the oil filter after every 100 hours running at the same time as the oil is changed. In the case of a new or reconditioned engine, the oil filter should also be changed for the first time after 20 hours running (see "Running-in the engine").

The oil filter is changed as follows:

Unscrew the old filter (see Fig. 12b). If it remains firmly in position and cannot be loosened, use a special tensioning tool or pierce the outer part of the filter with a screwdriver that can be used as a lever. Remember that oil can spill out.

Make sure that the contact surface against the engine block is clean. Smear the new filter rubber gasket with oil and screw on the filter by hand until it just comes into contact with the contact surface of the engine block.

Tighten the filter a further half turn but no more. Start the engine and run it at idling speed while checking to make sure there is no leakage at the filter.

Always check the oil level after changing the oil filter or changing the engine oil.

Quality	Viscosity Multigrade oil	Oil capacity, litres (Imp. qts. = US qts.) Excl. oil filter	Incl. filter
Service SE[1)]	SAE 10W/30	approx. 1.5 (1.3 = 1.6)	1.75 (1.55 = 1.85)

1) Previous designation Service MS

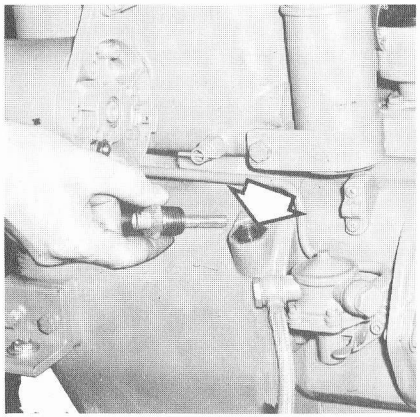


Fig. 12a. Hole for oil filling

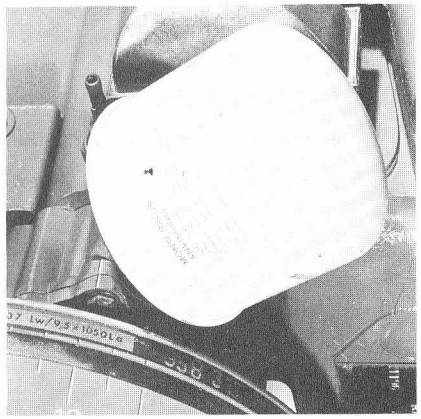


Fig. 12b. Oil filter

4.
Changing oil in reverse gear and reduction gear

Change the lubricating oil in the reverse gear and reduction gear after every 50 hours running or at least once each season.

During the running-in period the oil should be changed after 20 hours of operation.

The oil is drained through the reverse gear drain hole or is sucked up with the help of an oil scavenging pump through the hole for the dipstick. When adding oil, fill up to the upper mark on the oil dipstick, see table below.

Oil quality	Viscosity Multigrade oil	Oil capacity litres (Imp. qts. = US qts.)			
		excl. red. gear		incl. red. gear	
		min.	max.	min.	max.
Service SE[1]	SAE 10W/30	0.35 (0.31 = 0.37)	0.45 (0.40 = 0.48)	0.50 (0.44 = 0.53)	0.60 (0.53 = 0.64)

1) Previous designation "Service MS"

5.
Cleaning the oil strainer

An oil strainer is built into the engine bottom cover. The oil strainer should be cleaned in white spirit at least every other year or when the engine is taken out of the boat. Use a new gasket for the bottom cover and check for leakage after filling with oil.

6.
Cleaning the air cleaner

The air cleaner should be removed and cleaned after every 100 hours running, or once each season.

1. Release the lock screw with a screwdriver and remove the cleaner. See Fig. 13.
2. Clean the air cleaner in white spirit and soak it in engine oil.
3. Allow the engine oil to run off and re-fit the cleaner.

7.
Checking the vee-belts

Check the vee-belt tension after every 50 hours running. The belts can start slipping due to wear or grease.

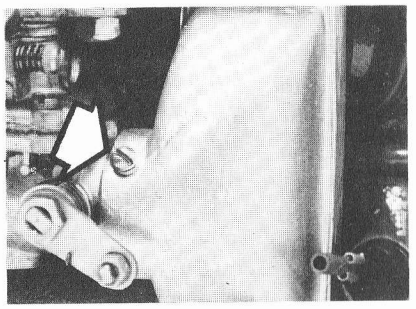


Fig. 13. Cleaning air cleaner, arrow shows lock screw[1]

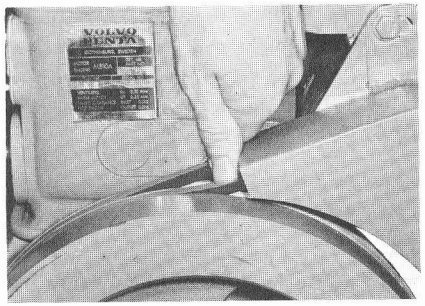


Fig. 14. Checking belt tension

Test the belt tensioning by pressing in the belts midway between the starter-generator and flywheel. It should be possible to press them in about 3–4 mm (1/8") under normal thumb pressure, see Fig. 14.

If an alternator is fitted, the vee-belt tension should be so hard that it is just possible to get the pulley to slip by turning with one finger a wing on the alternator fan.

If the belt is insufficiently tensioned, loosen the tensioner arm as well as the bolts at the alternator attaching points. Tension the belt by moving the alternator outwards and re-tighten the screws.

8.
Checking valve clearances

Check the engine valve clearances after every 100 hours running or at least once each season. Concerning valve clearances, see under "Technical Data". Any valve adjustment will involve grinding valve stem ends and seats and for this reason this should be carried out by an authorized Volvo Penta service workshop.

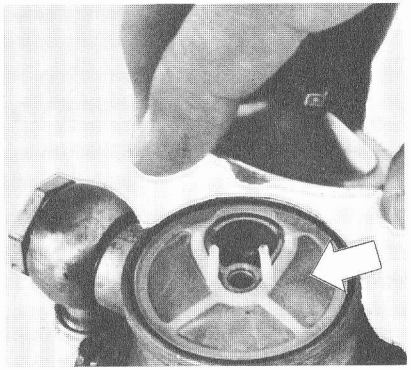
9.
Checking and cleaning fuel filter

The fuel filter should be cleaned after every 50 hours running or at least once each season.

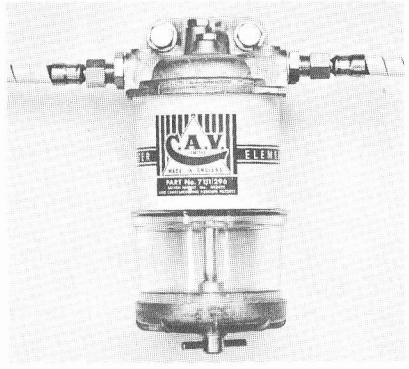
Wash the outside of the fuel pump clean and remove the cover and fuel filter, see Fig. 15. Clean the filter and re-fit it, with the pins facing upwards. Check the packing and re-fit the cover. Pump forward fuel with the hand primer and carefully check to make sure that the gasket does not leak. If the pumping effect is poor, turn over the engine a bit so that the fuel pump drive cam alters its position. If an

1) Late prod. type provided with clamp

extra fuel filter with water separator is fitted (Fig. 15), the transparent container should be checked for any water in the fuel. The water can be removed through the drain cock in the bottom of the filter container. Look out for fuel splash. The filter element should be changed at least once each season.



Cleaning fuel filter



Extra fuel filter with water separator

Fig. 15.

10.
Checking electrolyte level in battery

Check the battery electrolyte level at least every 14 days. The level should be between 5 and 10 mm (1/4 and 1/2") over the cell plates. Add distilled water whenever necessary. Never add too much since the electrolyte can then splash out and cause corrosion damage. Never check the electrolyte level by using a lighted match since gas formed in the battery cells is highly explosive.

11.
Checking and changing the spark plugs

Check the spark plug gap and wear at least after every 50 hours of operation. The electrode gap should be 0.7 mm (0.028") and this must be checked by using a wire type gauge. **If the electrodes are burnt or the insulation damaged, the plugs must be replaced immediately.** If necessary, clean the plugs with a wire brush. Make sure that you always get the right type of spark plugs with the correct heat range and also that the plugs are tightened to the correct torque. (See Technical Data.)

GENERAL SERVICING INSTRUCTIONS

12.
Check-tightening cylinder head bolts

With a new engine or when the cylinder head has been removed, the cylinder head bolts should be re-tightened after 20 hours running. Check-tightening of the bolts should also be carried out once each season and always with a torque wrench. Concerning tightening torque, see "Technical Data".

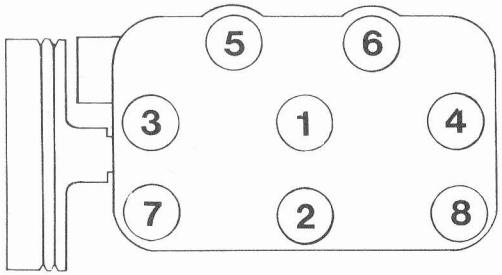


Fig. 16. Tightening sequence for cylinder head bolts

13.
Ignition timing and distributor

All adjusting work on the engine ignition system should be carried out by a service workshop with the special equipment required for this purpose. The ignition system is one of the most sensitive parts of the engine and interference here immediately leads to decreased engine output, high fuel consumption and, in the worst cases, serious engine damage.

The ignition timing and the distributor should be checked once each season.

IGNITION TIMING

The ignition timing is checked only with the help of a stroboscope at the speeds specified in the Technical Data. On the oil pump housing there is a notch and on the flywheel timing marks, see Fig. 17.

DISTRIBUTOR

Check the contact breaker points which must not be burned on the contact surfaces. Turn the engine over until the breaker points are fully open and check the breaker gap, A in Fig. 18, which should be 0.4 mm (0.016"). Make sure that the contacts are correctly located vertically so that the faces are completely opposite each other. The gap can be adjusted by turning the fixed contact (2, Fig. 18), after the lock screw for the attaching plate has been slackened.

Lubricate the distributor with a few drops of engine oil in the drive shaft lubricating wick (1) under the rotor. Lubricate also with oil the lubricator (3) under the distributor.

Inspect the distributor cap for cracks and clean all contact surfaces thoroughly. Check that the center contact stud is not loose and is not worn. See Fig. 19.

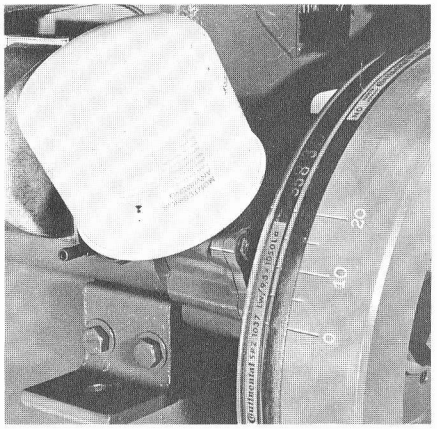


Fig. 17. Timing marks

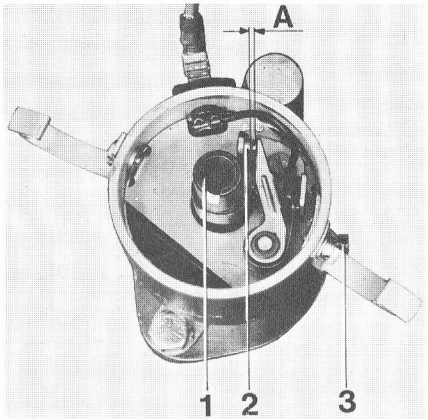


Fig. 18. Distributor, adjusting breaker contacts

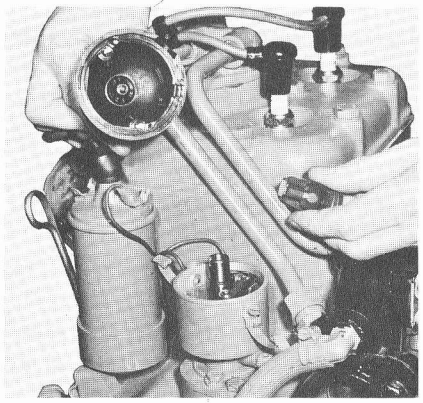


Fig. 19. Distributor, checking contact surfaces

14.
Adjusting the carburetor

The carburetor should be checked and adjusted by an authorized Volvo Penta service workshop.

Adjusting the idling speed

1. Check when the throttle control is in neutral position that the connecting sleeve of the control cable has a clearance of 1.5 mm (1/16") (A, Fig. 20) on each side of the "dice". Adjustments can be made partly with the carburetor lever and partly with the control lever.
2. Run the engine warm and check the idling speed, see under "Technical Data". Adjust the idling screw (1, Fig. 20) when necessary. If the engine runs unevenly, adjust the air screw (2) until even running is obtained. Check to make sure that the connection sleeve for the control cable has the proper clearance according to point 1.

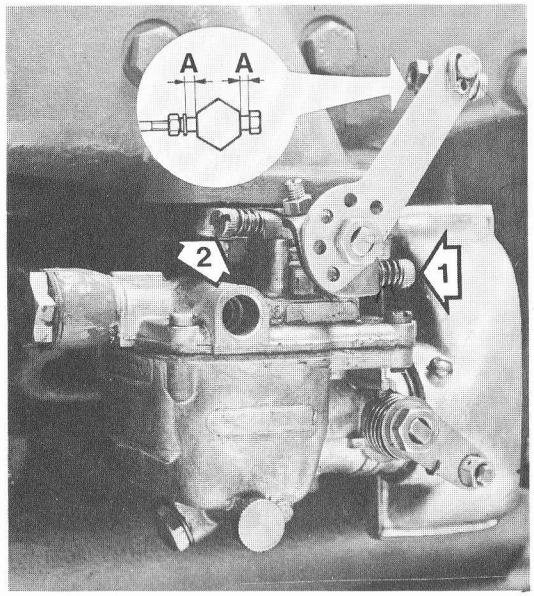


Fig. 20. Carburetor, Solex 26VBN2

1. Idling screw
2. Air screw

A = 1.5 mm (1/16")

15.
Cooling system

The cooling system should be checked regularly for leakage, deposits, etc.

The thermostat can be inspected after the water distributor housing has been removed.

REPLACING THE SEA-WATER PUMP IMPELLER

The pump impeller is made of neoprene rubber and this can be damaged in the case of water deficiency caused by, for example, blocking of the sea-water inlet. The pump impeller is changed as follows:

1. Close the bottom cock. Remove the cover from the sea-water pump. **Note the risk of water getting into the boat.** With the help of two screwdrivers pull the shaft with the pump impeller out of the housing as far as necessary in order to reach the bolt retaining the impeller. See Fig. 21. NOTE. Place some kind of protection under the screwdrivers in order not to damage the impeller housing.
2. Pull the impeller off the shaft. Clean the inside of the pump housing and fit the new impeller.
3. Fit the cover with its original gasket which has the right thickness. Always have a spare impeller on board. Open the bottom cock.

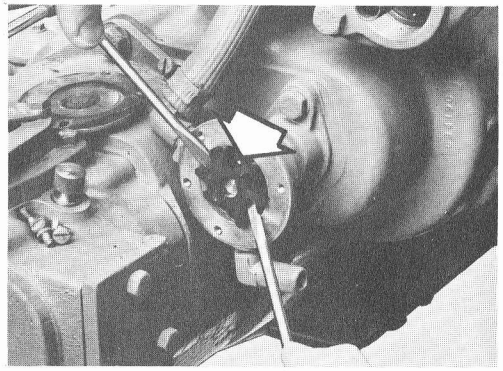


Fig. 21. Removing impeller. Arrow points to impeller lock bolt

16. Electrical system

CHECKING THE STATE OF CHARGE OF THE BATTERY

The state of charge of the battery should be checked at least once each season. This is done by using a hydrometer which shows the specific gravity of the electrolyte, this varying with the state of charge. (See under "Technical Data".)

CABLES AND CABLE TERMINALS

At regular intervals check that all cable terminals are properly tightened and that none of the cables is damaged.

STARTER-GENERATOR

All work on the starter-generator (and alternator if fitted) should be carried out by an authorized service workshop. Inspection and control should be done when the engine is given a general overhaul.

NOTE. This is particularly important when the engine is fitted with an alternator.

The battery poles and cable clamps should be well tightened and smeared with grease or vaseline.

WARNING!

If the alternator and its regulator are to function perfectly, it is extremely important that the following instructions are followed:

1. Never break the circuit between the alternator and battery while the engine is running. The result will be a short-circuit in the regulator which is immediately ruined.

   The master switch must never be switched off before the engine has completely stopped.
2. Never confuse the battery poles with one another. The poles are generally stamped with a plus and a minus sign respectively. The minus pole must always be earthed to the engine block.
3. Use only Volvo Penta double diode kits when charging two batteries from one generator.
4. In the case of starting by using a spare battery, this should be done as follows:

   Let the ordinary battery remain connected in circuit. Connect the spare battery to the ordinary battery, plus to plus and minus to minus. When the engine starts disconnect the spare battery but never break the circuit to the ordinary battery.
5. Never use a rapid charger while the alternator is connected to the battery.
6. Always disconnect both battery cables before carrying out any work on the alternator equipment.
7. If electric welding work is to be carried out on the engine or installation units, disconnect the charging regulator cables at the alternator and insulate.
8. Check vee-belt tension and cable connections at regular intervals.

17. Checking the reverse gear and reduction gear

The reverse gear and reduction gear should be checked regularly for oil leakage, abnormal noise or excessive operating temperature.

When remote control is connected, it must be so designed that there is no constant pressure on the control components of the reverse gear. When reverse gear is engaged for "Forward" or "Reverse", the remote control should be completely off-loaded. Adjust if necessary by loosening the lock nut and turning the cable "dice".

18.
Procedure if unit is to remain idle

IDLE PERIOD WITH BOAT AFLOAT

In case of an idle period of **less than one month** with the boat afloat, the engine should be started and run warm **after at least every 14 days** to prevent corrosion damage to the internal parts of the engine.

If the engine is to remain idle for a **longer period than one month**, then the engine should be inhibited, see under "Procedure before laying up"

Protect the engine and equipment from external corrosion damage by regularly spraying unpainted surfaces and electrical components with corrosion and moisture protection spray.

We also recommend that the cylinders are sprayed through the spark plug holes in the case of longer intervals of idleness.

PROCEDURE BEFORE LAYING UP

Before the boat is taken up on land for laying up, it is advisable to let an authorized service workshop test the engine and reverse gear. It is also advisable to carry out a compression test on the engine.

PREPARE THE ENGINE FOR LAYING UP BEFORE THE BOAT IS LIFTED OUT OF THE WATER AS FOLLOWS:

1. Run the engine warm, stop it and pump all the lubricating oil out of the engine and reverse gear with the help of the scavening pump.
2. Fill up the engine and reverse gear with inhibiting oil to the lowest mark on the dipstick. Suitable inhibiting oils are Esso Rust Ban 623, Shell Ensis Oil 20 or corresponding oils of another make.
3. Run the engine off-load for about 5 minutes.

AFTER THE BOAT HAS BEEN LIFTED ASHORE, CARRY OUT THE FOLLOWING PROCEDURE:

1. Inhibit the cooling system as follows:
   a. Drain off all cooling water from the engine and exhaust manifold by opening the drain cock (on the starboard side) and from the reduction gear by opening the drain plug, see Fig. 22. Then close the cock and drain plug.
   b. Mix rustproofing agent in a container filled with at least 20 litres (3 1/2 Imp. galls. = 4 1/2 US galls.) of fresh water. The rustproofing agent used should be of the emulsifying type, for example, Esso Cutwell 40, Shell Donax C or similar. Add 20 % rustproofing oil to the water and stir well. NOTE. Always add the oil to the water and never the other way around.

   c. Disconnect the suction line between the cooling water pump and bottom intake from the pump. When a reduction gear is fitted to the reverse gear, disconnect the suction line between the reduction gear and the bottom intake from the reduction gear.
   d. Instead connect a 1/2" rubber hose, the length of which should be sufficient to reach down to the bottom of the container with rustproofing mixture.
   e. Insert the connected suction hose into the container. Start the engine and let it run at idling until the water has been sucked out of the container, this forming a protective oil film in all the cooling channels. **NOTE. Never let the engine run dry since this can damage the cooling water impeller.** Then connect the cooling water hose.
   f. Drain all cooling water from the engine by opening the drain cock, see Fig. 22. **The rustproofing mixture does not protect the engine against frost.** If the engine is fitted with a wet exhaust line, this should also be drained of water. When a reduction gear is fitted, this should be drained of cooling water through the plug in the bottom of the reduction gear.
   g. Drain the cooling water pump by removing the pump cover. Take out the impeller (see under "Servicing", point 15) for winter storage. Let the drive shaft remain in position and re-fit the cover.
2. Remove the spark plug and spray each cylinder with inhibiting oil. Then turn over the engine several turns before re-fitting the spark plugs.

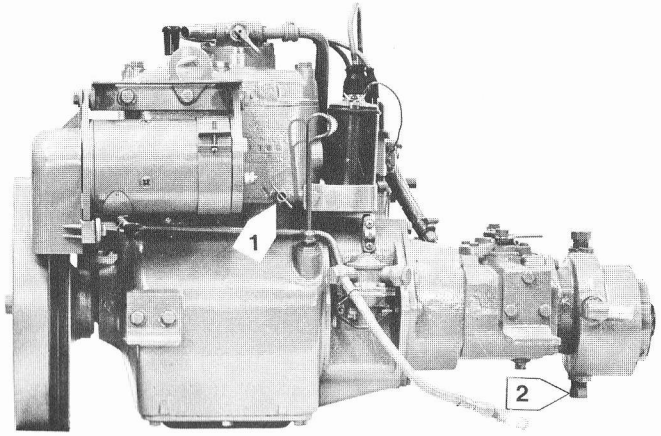


Fig. 22. Drain cock for cooling water, engine
1. Drain cock for cooling water, engine
2. Drain plug for cooling water, reduction gear

3. Clean the outside of the engine and reverse gear with white spirit or similar and touch up damaged paintwork. Protect all unpainted parts and the electrical system by spraying them with corrosion and moisture protective spray.
4. Remove the battery and put it into storage. It must be re-charged at regular intervals if it is to be kept in good condition.

PROCEDURE WHEN LAUNCHING

1. Pump out all the rustproofing oil from the engine and reverse gear, see under "Servicing", points 3 and 4.
2. Fill the engine and reverse gear with lubricating oil, see under "Servicing", points 3 and 4.
3. Fit the pump impeller in the cooling water pump, see under "Servicing", point 15, and connect all hoses and check-tighten the hose clamps.
4. Clean the outside of the engine and reverse gear of rustproofing oil and adjust the operating controls.
5. Take a fully charged battery on board and connect up the battery cables. **NOTE. Be careful not to confuse the cables (see under "Servicing", point 16). The negative battery pole should be earthed to the engine.**

   Grease in the battery cable clamps with grease or vaseline before tightening.
6. Remove the spark plugs and turn over the engine several turns with the starter-generator in order to blow out any rustproofing oil which may be on the tops of the pistons. NOTE. Prevent oil splash. Re-fit the spark plugs, see under "Technical Data" for their tightening torque.
7. Close the drain cock for the cooling system. Note. The plug for the reduction gear. Open the bottom cock for the cooling water intake.
8. Launch the boat and fill the fuel tank. Clean the fuel filter (see point 9) and pump forward fuel with the help of the hand primer. Check thoroughly the tank, lines, connections and cocks to be absolutely sure that there is no leakage.
9. Start the engine and follow carefully the running instructions given on pages 5–6. Run the engine warm with the reverse gear engaged. Check to make sure there is no leakage of fuel, water, oil, air or exhaust gases. If there is, attend to it immediately. Check the bolts and nuts for tightness.
10. **Contact an authorized Volvo Penta service workshop and have servicing of the engine and reverse gear carried out as specified in the maintenance scheme.**

General

Type desingation	MB10A
Max. output, h.p.	15
Max. speed, r.p.m.	2000
Number of cylinders	2 in-line
Type of operation	Side-valve, 4-stroke carburetor engine
Displacement, cc (cu.in.)	1018 (62.1)
Bore, mm (in.)	88.9 (3.50)
Stroke, mm (in.)	82 (3.23)
Compression ratio	6.5:1
Compression pressure (fully open throttle), speed, kp/cm^2 (p.s.i.)	7.5 (107)
Idling speed, r.p.m.	600
Total weight, approx. kg (lb.), engine + reverse gear	115 (253)
Max. inclination of engine in boat underway	18°

Valves

Valve clearances, warm engine[1]	
Inlet valve, mm (in.)	0.30 (0.012)
Exhaust valve, mm (in.)	0.35 (0.014)
Valve clearances, cold engine[1]	
Inlet valve, mm (in.)	0.35 (0.014)
Exhaust valve, mm (in.)	0.45 (0.018)

Reverse gear

Type designation	Volvo Penta MS
Ratio "Forward" and "Reverse"	1:1
Ratio with auxiliary gear	1.91:1

Lubricating system

Engine

Oil quality	Multigrade oil Service SE[2]
Viscosity	SAE 10W/30
Oil capacity, engine, litres (Imp. qts. = US qts.), approx.	
excl. filter	1.5 (1.3 = 1.6)
incl. filter	1.75 (1.55 = 1.85)
Oil pressure, warm engine, idling speed, kp/cm^2 (p.s.i.)	1–2 (14–28)
at full speed, kp/cm^2 (p.s.i.)	4 (57)

Reverse gear

Oil quality/Viscosity	Same as engine
Oil capacity, litre (Imp. qt. = US qt.)	0.4 (0.35 = 0.42)
Oil capacity with auxiliary gear, litre (Imp. qt. = US qt.)	0.55 (0.48 = 0.58)

1) Adjustment is carried out by grinding valve stem ends and seats
2) Previous designation "Service MS"

Fuel system

Carburetor, Solex type	26 VBN2
Main jet	102.5
Idling jet	45
Float valve	1.2
Fuel pump feed pressure, kp/cm^2 (p.s.i.)	0.2 (3)

Petrol grade

Octane rating ROT, min.	80

Ignition system

Cylinder marking	1 nearest flywheel
Spark plugs, Bosch type	W175T35 (alt. corresponding spark plug of other make)
Gap, mm (in.)	0.7 (0.028)
Early prod.	
Distributor, Bosch type	JF2 0231 109 014
Basic setting	3° after T.D.C.
Stroboscope setting, 1200 r.p.m.	9,5°
Gap, mm (in.)	0.4 (0.016)
Cam angle	60° ± 3°
Late prod.	
Distributor, Bosch type	JF2 0231 109 015
Basic setting	2° (before T.D.C.)
Stroboscope setting, 1200 r.p.m.	11°
Gap, mm (in.)	0.4 (0.016)
Cam angle	60° ± 3°

Electrical system

Voltage, volts	12
Battery capacity, Ah max. (SIBA STARTER GENERATOR)	34
Battery capacity, Ah max. (BOSCH STARTER GENERATOR)	60
Battery electrolyte specific gravity:	
Fully charged battery, g/cm^3	1.275–1.285
Battery to be re-charged at g/cm^3	1.230
Starter-generator, type Siba	DS418
Generator output, W	60
Starter motor output, h.p.	0.8
Starter-generator, type Bosch	LA/Ej 90/2900
Generator output, W	135 max. 90 kont.
Starter motor output, h.p.	1

Tightening torques

Cylinder bolts, kpm (lb.ft.)	8.3 (60)
Spark plugs, kpm (lb.ft.)	3.8 (27.5)
Flywheel (nut), kpm (lb.ft.)	38 (275)
Connecting rod nuts, kpm (lb.ft.)	5.5 (40)

TRACING FAULTS IN CASE OF RUNNING INTERRUPTIONS

The fault-tracing scheme below includes only the more usual reasons for faulty operation. With the help of the instructions given in this book it is usually possible to trace most of the causes mentioned below. In case of doubt always contact the nearest Volvo Penta service workshop.

Follow the instructions in the servicing scheme — this ensures the best running reliability.

Engine will not start	Engine stops	Engine does not reach top speed at full throttle	Engine runs roughly or vibrates abnormally	Engine overheats	FAULT TRACING	Remarks
x					Master switch not on: battery discharged or broken electric cable	See pages 20–21
x	x				Fuel tank empty, fuel cock closed, fuel filter blocked	See page 15
x	x		x		Water or impurities in fuel	See page 16
x	x	x	x		Faulty spark plugs	See page 16
x					Burnt breaker points, moisture in distributor and ignition cables	See page 17
	x		x		Idling speed not properly adjusted	See page 19
		x			Boat abnormally loaded	See page 4
		x			Marine growth on boat bottom	See page 4
		x	x		Propeller damaged	
				x	Blocked cooling water intake or cooling jackets, defective pump impeller or thermostat	See pages 19, 20